

PERVIOUS PAVEMENT DESIGN CONSIDERATIONS for EFFECTIVE APPLICATIONS



Sean Hayes, P.E.

Segment Overview



- Design goals
- Design criteria
- Example – Sports Complex

Establish Your Design Goals

- Storm water capture and level of treatment
- Vehicle types and volume
- Durability
- Aesthetics
- Maintainability
- LEED points or sustainability goals
- Budget

Design Criteria

- Design storm (volume, rate)
- Permeability of installed system
- Allowance (SF) for clogging
- Use of underdrains
- Strength of materials
- WDNR Conservation Practice Standards (1002-5)

Subsurface & Site Data

- ❑ Soils data: type, permeability, load bearing capacity
- ❑ Depth to groundwater
- ❑ Depth to bedrock
- ❑ Presence of buried waste
- ❑ Groundwater contamination risks
- ❑ Utilities
- ❑ Site topography
- ❑ Area foliage

Specifications

- ❑ Pavement: perm, compressive strength, color
- ❑ Sub-base reservoir, base reservoir, bedding course
- ❑ Geotextile and/or filter fabric
- ❑ Borders
- ❑ Installer qualifications

Example – Sports Complex

- Multi-use facility
 - Roller derby to dog shows.
 - Lot is often full (Maximize Parking)
- 5 acre, 600 stall, parking lot.
 - 1 acre asphalt, 4 acres gravel
 - Had agreement with City of Franklin to eventually pave entire lot.
 - Departments worked together co-funding the project
 - Our first pervious pavement parking lot project
 - Project had to demonstrate effectiveness

Site



Site



Site



Design



- Geotechnical engineer for soil borings.
- Collaboration between Site Civil, Stormwater Engineer, Landscape Architect.
- Small consulting contract to review conceptual design.

Design

- Geotechnical engineer for soil borings.
 - ▣ Soil strength
 - ▣ Infiltration rates
 - ▣ Depth to ground water
 - ▣ Frost susceptibility
 - ▣ Made recommendations on base layers required for pervious pavement

Design



- Consultant Review Contract
 - ▣ Review and comment on concept plans
 - ▣ Provided and extra level of comfort

Design Standards

- Milwaukee County Parking Lot Stormwater Guide.
- DNR Tech Std
 - STD 1002 (Site Evaluation for Stormwater Infiltration)
- Permeable Interlocking Concrete Pavements, 3rd Ed.
 - Interlocking Concrete Pavement Institute
- Other
 - EPA – Permeable Interlocking Concrete Pavement
 - New Jersey Stormwater Manual



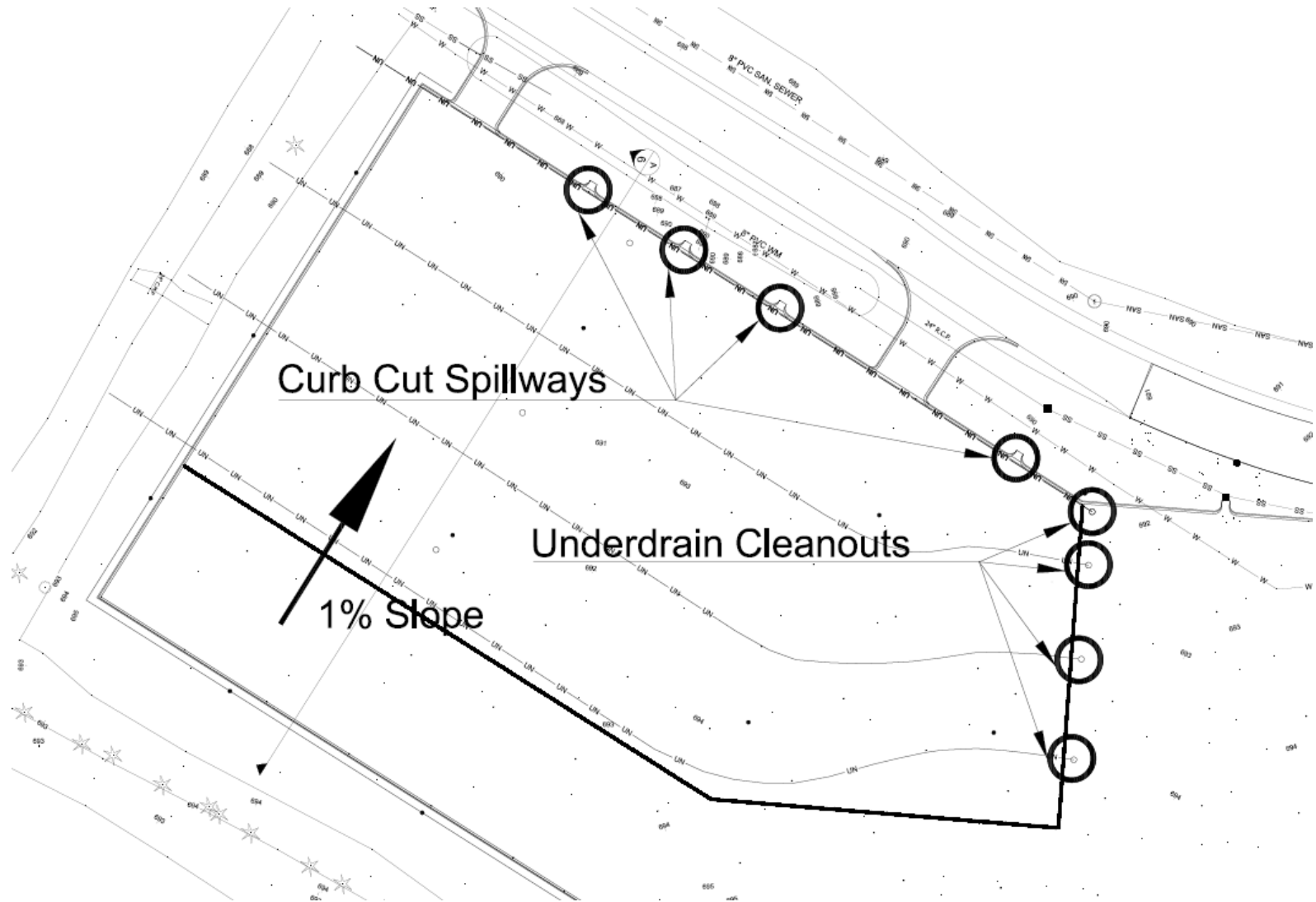
Design

- Considered
 - ▣ Parking capacity
 - Maximize
 - ▣ Maintenance capacity
 - Winter plowing
 - Adjustability
 - ▣ Treatment capacity
 - TSS
 - Peak flow reduction
 - ▣ More subsurface storage
 - ▣ Pavers only in parking stalls
 - ▣ Less total pavers
 - ▣ Future bike path expansion

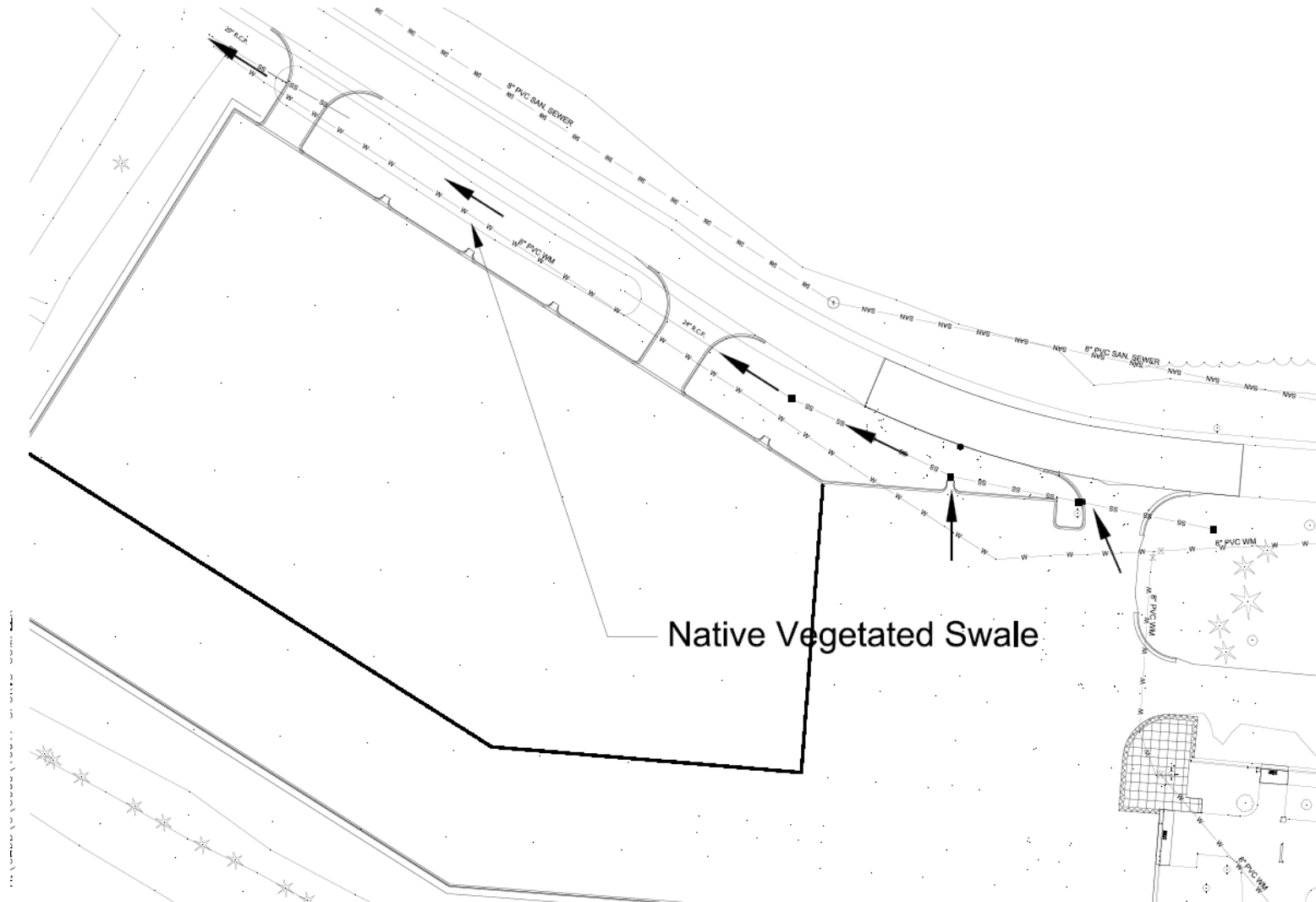
Design

- Fail Safe Aspects
 - ▣ Underdrains
 - ▣ Underdrain clean outs
 - ▣ 1% surface slope
 - ▣ Curb cut drains

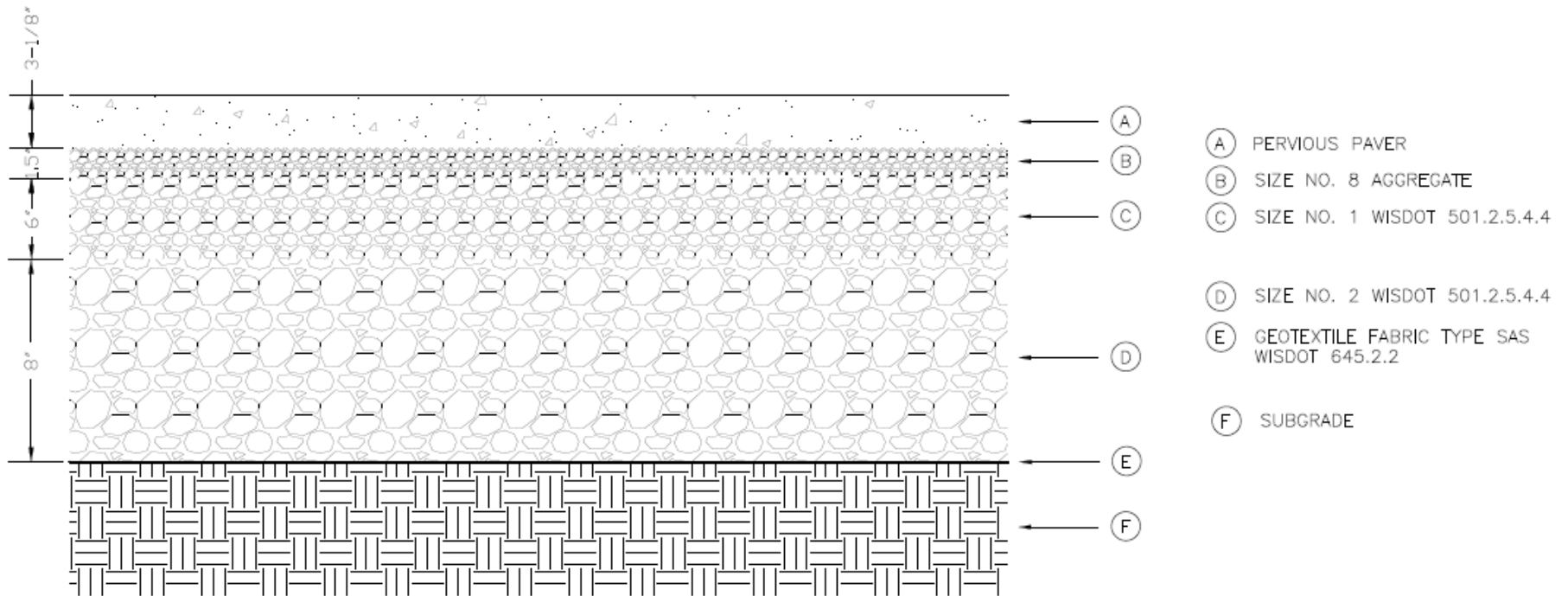
Design



Design

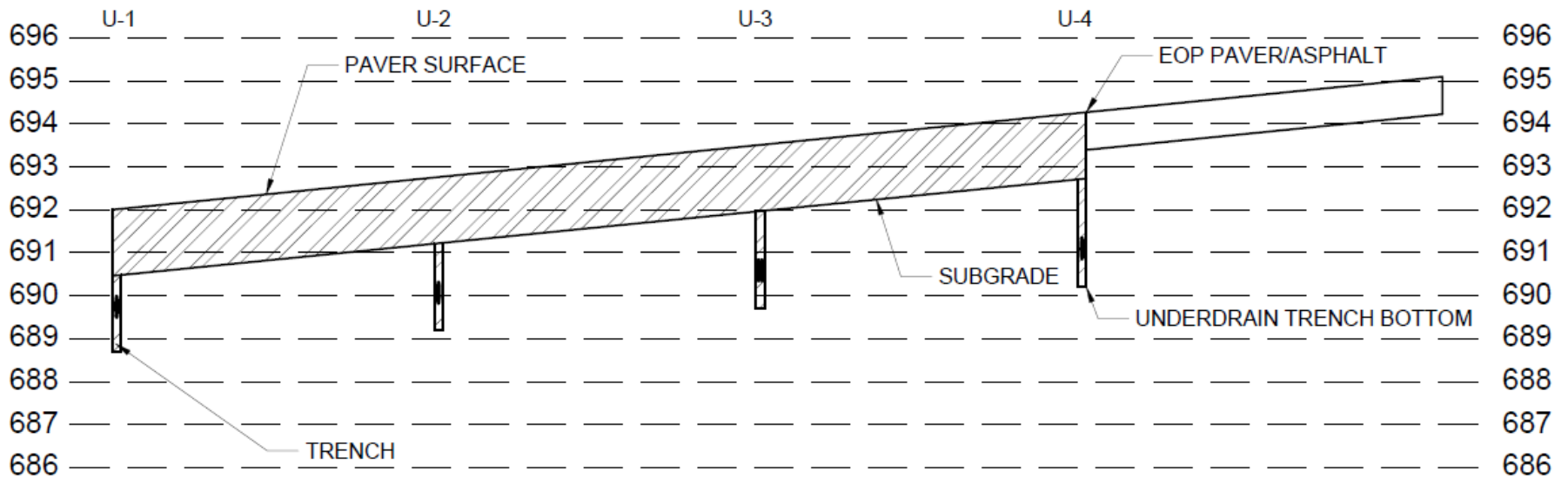


Design



POROUS PAVEMENT SECTION

Design

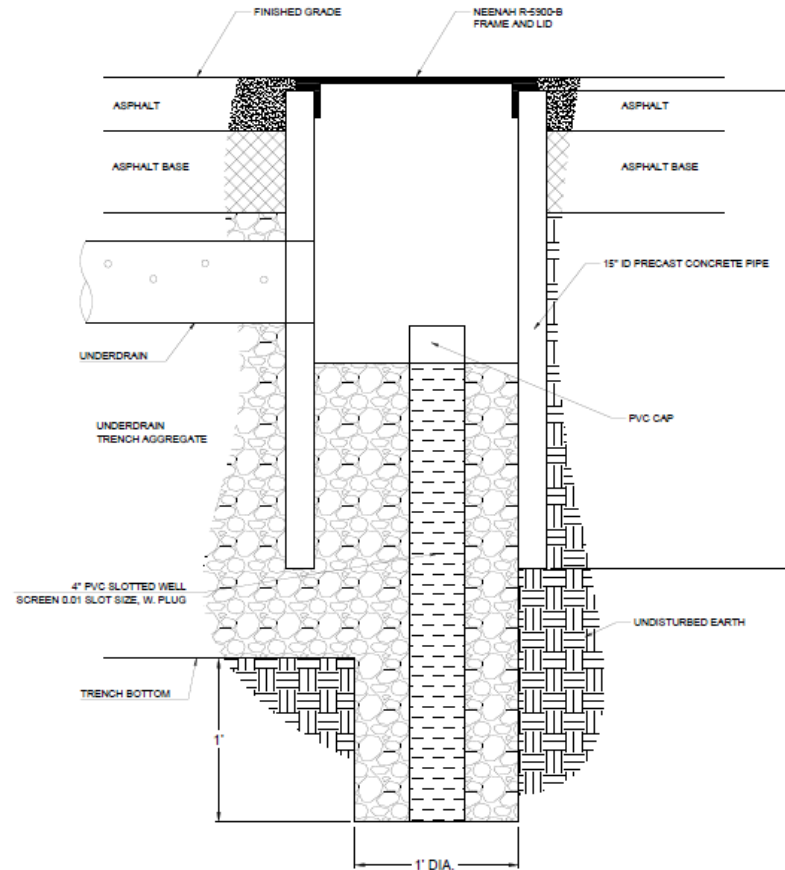


UNDERDRAIN SECTION A

SCALE: H1"=30' V1"=3'



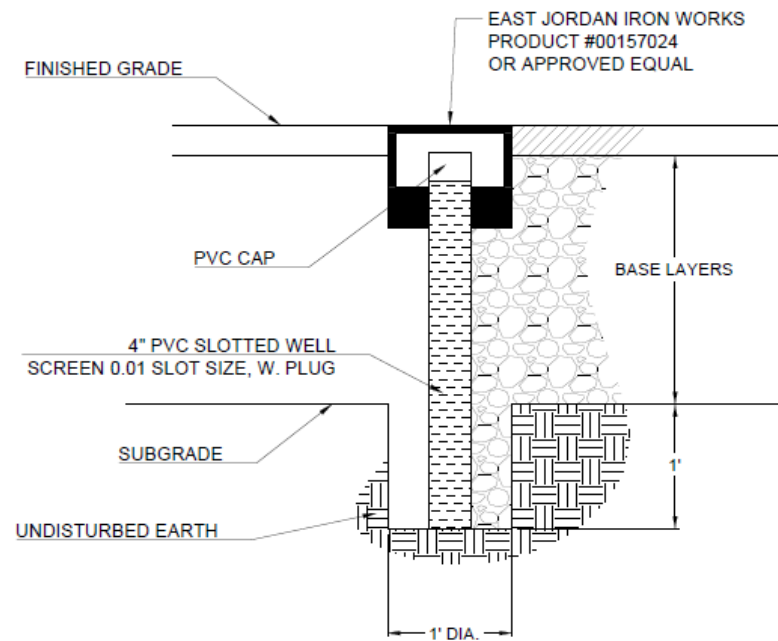
Design



UNDERDRAIN CLEAN OUT DETAIL

SCALE: NTS

Design



NOTE: WELL COVER SHALL BE SECURED IN CONCRETE SURROUND (1'-6" TOTAL DIA.).

OBSERVATION WELL

SCALE: NTS



Construction



Construction



Construction



Construction



Construction



Construction



Construction



Construction



Maintenance

- UNILOCK – Pervious Paver Maintenance Guide
 - ▣ Refill joint material
 - ~6 months after installation
 - Every 5-10 years there after
 - ▣ Winter plowing
 - Plow as you would concrete.
 - Can use nylon edge blade for cosmetic reasons
 - (Johnson Controls uses. Costs ~\$200/snow in new blades)
 - ▣ Avoid stockpiling snow / topsoil / mulch / etc.

Evaluation

- Compare effluent from underdrains and effluent from paved surfaces.
 - ▣ TSS, Oils and greases, Conductivity
- Monitor observation wells over time
 - ▣ Record depths over time
- Visual observations over winter
 - ▣ Cracked bricks
 - ▣ Frost heave

Comparison

Up Front Costs		
	With Pavers	Without Pavers
Parking Lot	\$ 1,090,000	\$ 850,000
Storm Water Facility	Incl	\$ 100,000
Total	\$ 1,090,000	\$ 950,000

Long Term Costs		
	With Pavers	Without Pavers
O&M	Vacuum, Gap Stone	Crack / Pothole Fill
Life Est	50 years	20 Years

Next Time...

- Add more control
 - ▣ Manhole / elevation control structures
- Push for more green space
 - ▣ Islands etc.
- Evaluate using less pervious surface area
 - ▣ Maybe 1/3 total paved area
- Specify brick pattern layout



Thanks!

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